# CS 472 Computer Architecture, Sections B1/EX

Fall Semester 2017 / On Campus – CAS 227, 685-725 Comm. Ave. / Tuesday nights 6-9:00 p.m.

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Website:    Blackboard (https://learn.bu.edu/)  17fallmetcs472_b1

Text:    David A. Patterson and John L. Hennessy
        Computer Organization & Design: The Hardware/Software Interface
        Fifth Edition (ISBN 978-0-12-407726-3)
        Available at the BU bookstore or online. No other edition is acceptable!

Prerequisites:  MET CS231 or CS232 (**Do not ignore this prerequisite!**  You need to be proficient in some language, comfortable handling arrays and classes of data.)  Some assembly language is helpful but not mandatory.

Description:  Computer organization with emphasis on processors, memory, and input/output. Includes pipelining, ALUs, caches, virtual memory, parallelism, measuring performance, and basic operating systems concepts. Discussion of assembly language instruction sets and programming as well as internal representation of instructions. (In short, enable you to understand the internal workings of computers, what makes them fast, and what the primary design challenges are.)

Grades:  There will be a midterm (30%) and a final (40%) which will together account for 70% of the grade. There will be also three programming projects (in the language of your choice) for the other 30%.  Late submissions will be accepted with a 10% pro-rated penalty for each week late *except for the final project*.

In general, an "A" will be awarded for work that totals 92-100% of the possible points, "A-" for 90-92%, "B+" for 88-90%, "B" for 82-88% and so on down to F for below 60%.  Grades may be scaled upwards based on class scores, but not downwards.

Grades are YOUR responsibility.  If you need a particular grade to get into the M.S. program, receive tuition reimbursement or stay academically eligible, then it is YOUR responsibility to perform at that level.  "A" work will get you an "A" and "F" work (or cheating) will get you an "F".

There is an attempt to distinguish between exceptional work and that which falls short of that level. Do not expect the typical grade to be an A. Grades of D or F are almost always the result of cheating or not doing projects.

Policies:  Attendance is not a part of your grade. However, you are expected to take the exams at the scheduled time.  If that is impossible, you must take the exam before the rest of the class.  If you are a "no show" you get a zero.

Exams are closed book, with no notes.  However, reference material from the text is provided to make the test one of your understanding rather than photographic memory.  The focus is on thorough comprehension of the concepts, not mindless memorization of trivia.

Ethics:  I try to be friendly and to inject humor into the lectures, but don't mistake that for anything less than a zero-tolerance policy toward cheating.  YOU CHEAT, YOU FAIL, subject to procedural review.

All projects in this course are INDIVIDUAL.  Feel free to discuss ideas with your classmates, but **any** shared code will mean an F for the course. **No exceptions!**  It is not acceptable for someone else to do your work, whether that be a classmate, a spouse or anyone.  Do not share even one line of code.

Incompletes: Incompletes will be given only in the case of serious emergencies or other documented extenuating circumstances clearly beyond the student's control. Incompletes will NOT, repeat NOT, be given to students who abandon the class, students not satisfied with their grade, students who are too busy to complete the work on time and students who miss the final exam.

Availability: I will do my best to make myself available to you. I have provided my email address and phone number and encourage you to use them as long as you have consulted your textbook and notes first.

Weather: Call (617) 353-SNOW if you have any questions about whether class will be held. If that number says that BU is open, we will have class.

## SCHEDULE

| Date | Topics | Related Reading |
|---|---|---|
| Sep 5 | Course Overview, Number systems, Signed numbers, Characters | Chap. 1.2, 2.4, 2.5, 2.9, skim rest Chap 1 |
| Sep 12 | MIPS Instructions - Assembly Language and Internal Representation<br>*First project assigned: Due Oct 3* | Chapter 2 (skip asm programming, focus on internal rep) |
| Sep 19 | Measuring Computer Performance, CISC/RISC<br>The Memory Hierarchy - Caches (Part 1) | Chapter 1.6<br>Chap. 5.1, 5.3, 5.4 (ignore math), 5.8 |
| Sep 26 | The Memory Hierarchy - Caches (Part 2),<br>*Second project assigned: Due Nov 7* | |
| Oct 3 | The Processor: Datapath and Control | Chapter 4.1 - 4.4 |
| Oct. 10 | NO CLASS – (Monday classes meet due to Columbus Day holiday) | |
| Oct 17 | Pipelines (Part 1) | rest of Chapter 4 |
| Oct 24 | MIDTERM EXAM | |
| Oct 31 | Midterm Discussion, Pipelines (Part 2)<br>*Third project assigned: Due Dec 5* | |
| Nov 7 | Advanced Architectures - Superscalar, Superpipelining | |
| Nov 14 | Parallelism, Multicores, OS Concepts, Virtual Memory, Start-of-the-Art Cache extensions | Chapter 6, Chap 5.6 |
| Nov 21 | Logic Design, Computer Arithmetic and ALUs | App. B: pp. 1-14 |
| Nov 28 | Wrap-up | |
| Dec 5 | Final Exam Review | |
| Dec 12 | NO CLASS – Study Period | |
| Dec 19 | FINAL EXAM | |